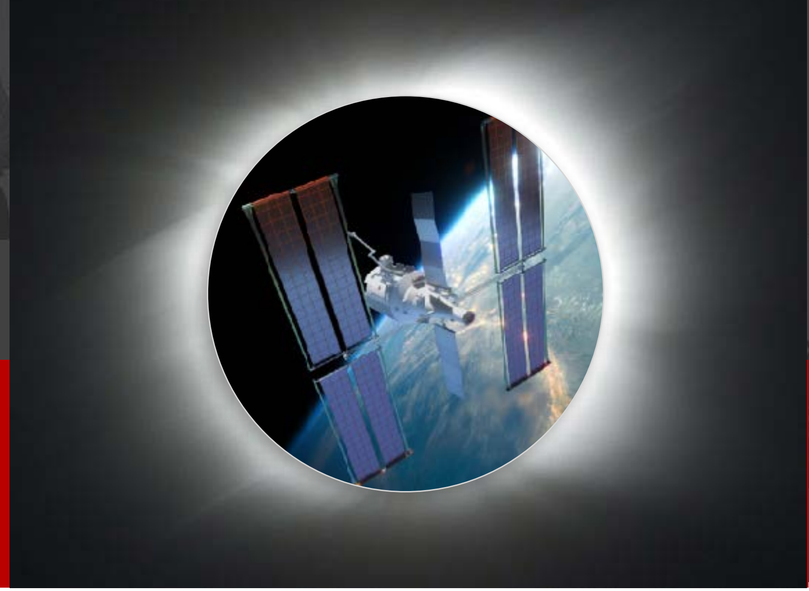
THE OHIO STATE UNIVERSITY



Research - the first link in the value chain of prosperity

OFRN Opportunity Day

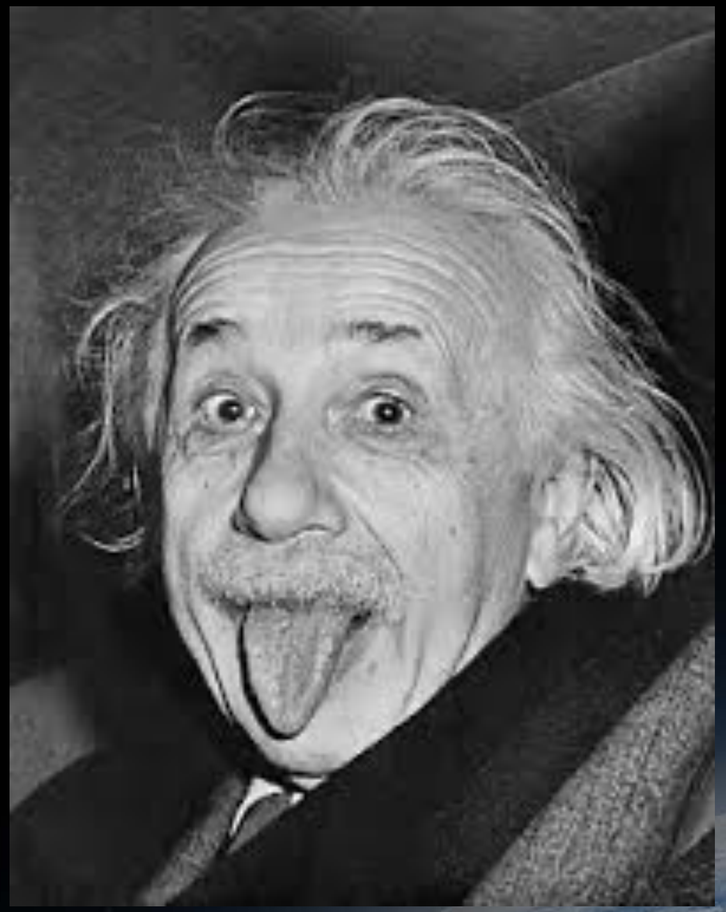
John M. Horack, Ph.D.
Vice President for Research
Professor and Neil Armstrong Chair in Aerospace Policy

College of Engineering and
John H. Glenn College of Public Affairs
The Ohio State University

horack.1@osu.edu

February 10, 2026
Columbus, Ohio

A tale of two researchers…



What good is their abstract brain-work to any of us?

How many times have you used space today?

Can we imagine life without it?

Whether you know it or not…

Harvard Business Review

Innovation

Your Company Needs a Space Strategy. Now.

by Matthew Weinzierl, Prithwiraj (Raj) Choudhury, Tarun Khanna, Alan MacCormack, and Brendan Rosseau

From the Magazine (November–December 2022)

The global space economy will grow from $630 billion in 2023 to **$1.8 trillion by 2035**, serving an increasingly connected and mobile world.

World Economic Forum Insight Report
McKinsey and Company, April 2024

https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/space-the-1-point-8-trillion-dollar-opportunity-for-global-economic-growth#/

Space, while still "exotic," has become an essential part of modern life.

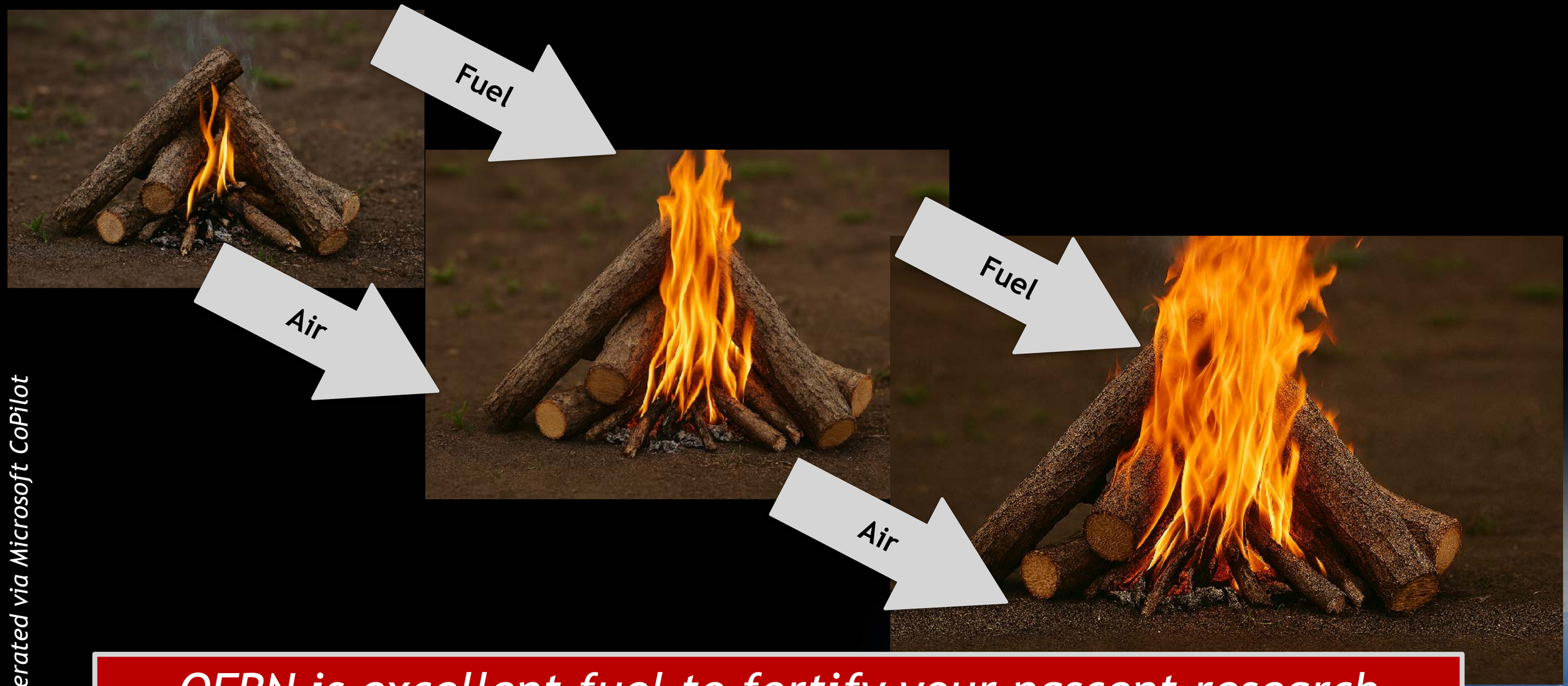
Research: the first link in the value chain of prosperity.

The research we do today in Ohio defines the world of tomorrow.

How not to start a major research effort

AI-generated via Microsoft CoPilot

A better way - the right fuel at the right time



AI-generated via Microsoft CoPilot

OFRN is excellent fuel to fortify your nascent research

The importance of OFRN as catalyst

- $72M State Investment
- Five (5) Federal Requirement-holding Partners
- 48 projects funded
- 16 new companies created
- 391 direct jobs created
- $405+ M in follow-on funding awarded

The research we do today in Ohio defines the world of tomorrow.

Data from OFRN Website :: retrieved 5 February 2026

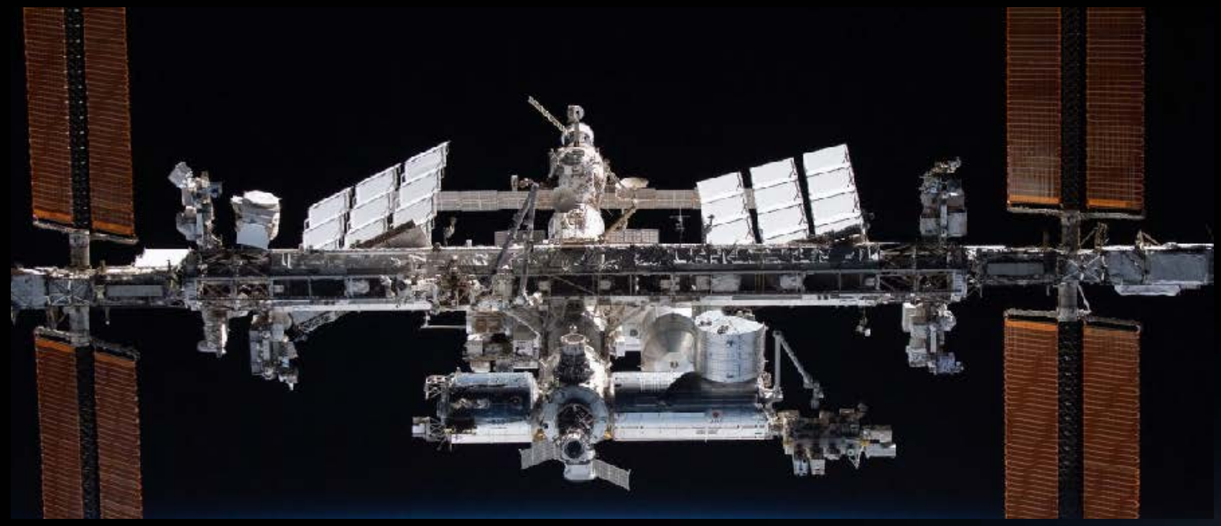
Space Research at Ohio State is a pillar of our future portfolio.

And OFRN plays a major role.

One Example: Our work in Starlab, the future of low-Earth orbit research, and the VISTA space park

International Space Station - to be “retired”

- Continuous Human presence in low-Earth orbit since November 2000.
- Contract signed between NASA and SpaceX to de-orbit the ISS in 2030.
- Moving beyond "Government Space Stations” to the *Commercialization and Industrialization of low-Earth Orbit*.
- **<u>Investment Examples</u>:**
  - *US/NASA - Three awards made by NASA in December 2021 to stimulate development of privately-owned, commercially operated space stations in low-Earth Orbit.*
  - *Japan/MEXT: “Space Strategy Fund” - $6.7B US over 10 Years, including LEO*



<u>Research</u> - the first-link in the value-chain of prosperity.

STARLAB: A Next-Generation *Commercial* Space Station

Crew Habitat and Laboratory

- Four astronauts, 24/7/365,
- ~8m diameter, 340 m^3 volume
- Modular, reconfigurable laboratory

Global Joint Venture

- *Voyager Technologies (lead)*
- *Airbus GmbH*
- *Mitsubishi Corporation*
- *MDA*
- *Palantir*
- *Hilton (Strategic Partner)*
- *Northrop Grumman (Strategic Partner)*
- *The Ohio State University (Strategic Partner)*

One Launch

Starlab will deploy from a single launch aboard SpaceX Starship

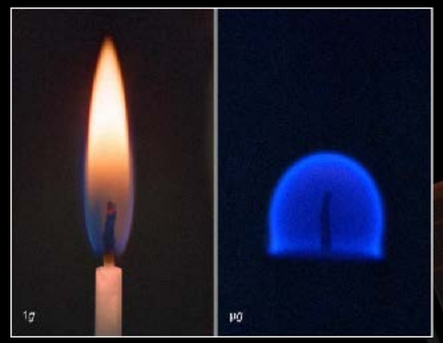
No Gap in LEO

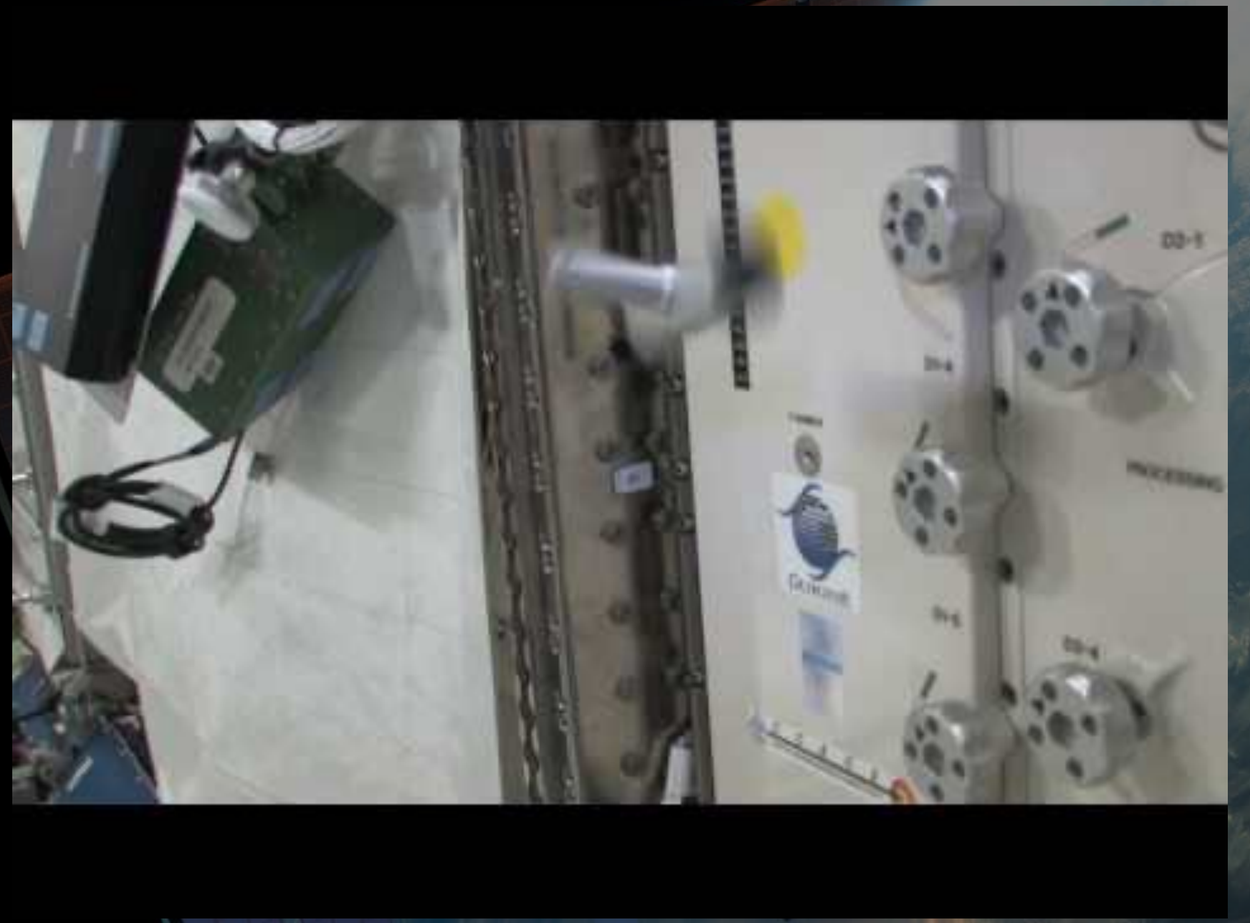
Overlap with ISS operations from launch through ~2030

The Ohio State University - lead university in* Starlab *partnership

What changes in low-Earth orbit?

- Convection.
- Hydrostatic Pressure.
- Diffusion.
- Capillary Action.
- Surface Tension.
- Radiation.
- Atomic Oxygen.
- Hard Vacuum.
- Human factors, health, and physiology.
- Endothermic/Exothermic behaviors.
- Two phase (e.g., liquid-gas) separation
- Mechanical/vibrational impacts.





Spaceflight - a UNIQUE LABORATORY to fortify research, addressing key questions across nearly all domains.

Proven Markets and Research Areas of Interest

- Pharmaceuticals
- Medical Devices
- Household Products
- Advanced Materials
- Semiconductors
- Plant and Agriculture
- Advanced Communications
- BioManufacturing
- Life Sciences and Human Health

Published Results From Crystallization Experiments on the ISS Could Help Merck Improve Cancer Drug Delivery

DECEMBER 2, 2019 • BY AMELIA WILLIAMSON SMITH, STAFF WRITER

New Space-Based Study Shows Promising Results for Treating, Preventing Post-Traumatic Osteoarthritis

MAY 28, 2024

ISS National Lab-Sponsored Study Tests a Novel Gene Therapy for Vision Loss

MARCH 14, 2024

LambdaVision Aims to Refine Process for In-Space Manufacturing of Artificial Retinas Through ISS National Lab-Sponsored Investigation

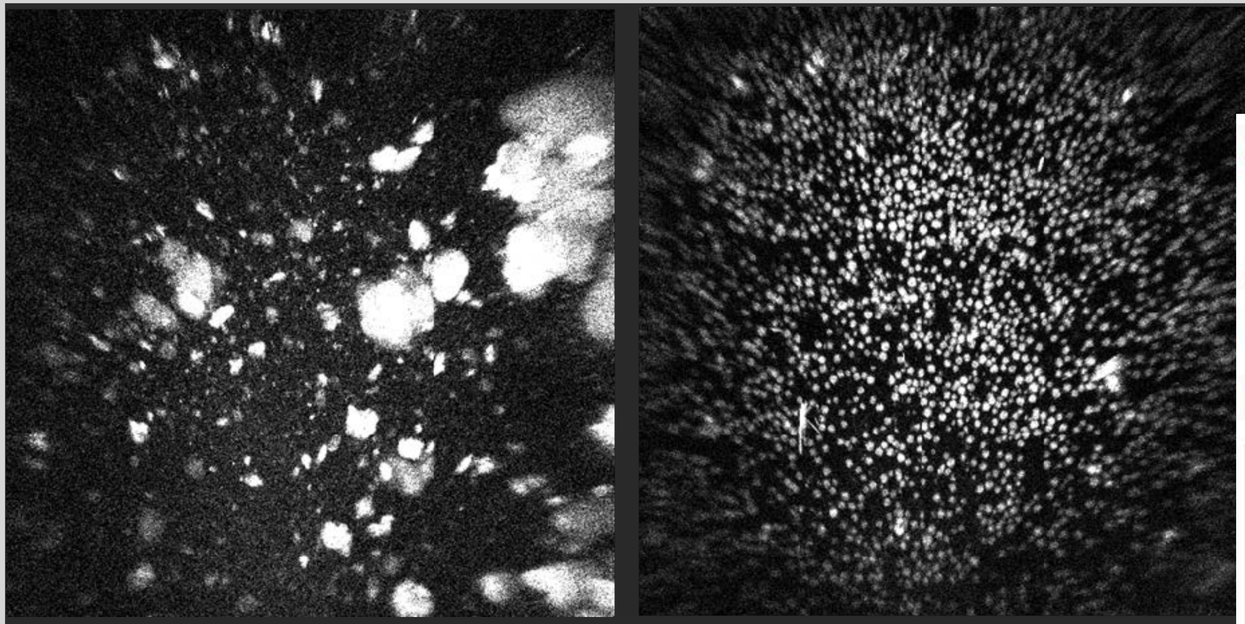
JANUARY 22, 2024

Cultivating the Cosmos: Decoding Crop Resilience Through Space-Grown Cotton

SEPTEMBER 29, 2023 • BY STEPHENIE LIVINGSTON, STAFF WRITER

Space is a proven research laboratory and environment to fortify your objectives.

Keytruda™ - Improved Crystalization in Space



Ground (left) and Space (right) -based crystallization of Pembrolizumab.

Learnings from spaceflight transformed ground-based processing, enabled a patent renewal, and boosted clinical outcomes of this ~$28B per year cancer medicine (4x Q1-2024 reported sales).

npj | Microgravity

www.nature.com/npjmgrav

ARTICLE OPEN

Pembrolizumab microgravity crystallization experimentation

Paul Reichert[1*], Winifred Prosise[1], Thierry O. Fischmann[1], Giovanna Scapin[1], Chakravarthy Narasimhan[2], April Spinale[3], Ray Polniak[4], Xiaoyu Yang[5], Erika Walsh[2], Daya Patel[5], Wendy Benjamin[2], Johnathan Welch[5], Denarra Simmons[6] and Corey Strickland[1]

Crystallization processes have been widely used in the pharmaceutical industry for the manufacture, storage, and delivery of small-molecule and small protein therapeutics. However, the identification of crystallization processes for biologics, particularly monoclonal antibodies, has been prohibitive due to the size and the flexibility of their overall structure. There remains a challenge and an opportunity to utilize the benefits of crystallization of biologics. The research laboratories of Merck Sharp & Dome Corp. (MSD) in collaboration with the International Space Station (ISS) National Laboratory performed crystallization experiments with pembrolizumab (Keytruda®) on the SpaceX-Commercial Resupply Services-10 mission to the ISS. By leveraging microgravity effects such as reduced sedimentation and minimal convection currents, conditions producing crystalline suspensions of homogeneous monomodal particle size distribution (39 µm) in high yield were identified. In contrast, the control ground experiments produced crystalline suspensions with a heterogeneous bimodal distribution of 13 and 102 µm particles. In addition, the flight crystalline suspensions were less viscous and sedimented more uniformly than the comparable ground-based crystalline suspensions. These results have been applied to the production of crystalline suspensions on earth, using rotational mixers to reduce sedimentation and temperature gradients to induce and control crystallization. Using these techniques, we have been able to produce uniform crystalline suspensions (1–5 µm) with acceptable viscosity (<12 cP), rheological, and syringeability properties suitable for the preparation of an injectable formulation. The results of these studies may help widen the drug delivery options to improve the safety, adherence, and quality of life for patients and caregivers.

npj Microgravity (2019)5:28 ; https://doi.org/10.1038/s41526-019-0090-3

"…widen the drug delivery options to improve the safety, adherence, and quality-of-life for patients and caregivers."

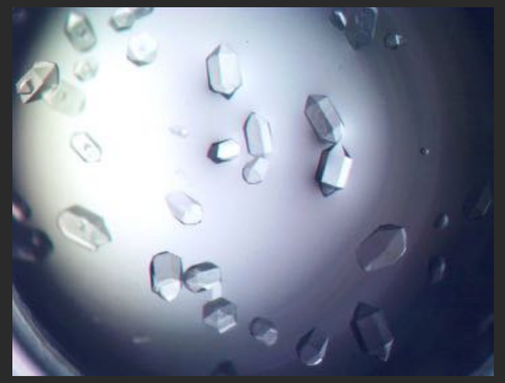
Creating unique and compelling value from space-based research

Unique Environment

- *"Weightlessness"*
- *Hard Vacuum*
- *Space Radiation*
- *Environmental Effects*
- *Isolation*
- *Confinement*

(No laboratory on Earth can provide these conditions, at any price)

Unique "Things"



Unique Information

Ship or Transmit to Ground (with or without in-space pre-processing)

Earth-based laboratories, infrastructure, companies, agencies, people

Keys to value-creation: lowering friction, building an integrated Earth-based ecosystem

VISTA Space Park @ Ohio State

- First space-focused research park with complementary assets and infrastructure in space (Starlab) and on Earth.
- University, Government, Private Sector collaborators in space-related research, technology, development, education, outreach, and innovation.
- Global, multi-disciplinary, outcome-focused.
- Voyager Technologies and The Ohio State University partnership.
- Enabling the entire spectrum of low-Earth orbit Commercialization and Industrialization goals, through research.

VISTA

THE OHIO STATE UNIVERSITY

Direct leverage of University-based assets, people, laboratories, and infrastructure to fortify space-based research.

University-based Science Park - Key Benefits

- Leveraging the ‘unique variables’ of space research through a global innovation ecosystem.
- Collaborating and integrating across government, private-sector, and university domains.
- Accessing directly, advanced university facilities, people, and teaming, to fortify research.
- Executing ground-based research, training, payload development, integration, and operations.
- Building future talent in global spaceflight.
- Reducing cost of flight, through collaborative space research missions.
- Enabling start-up companies and research commercialization.
- Creating high-value jobs and companies.
- Engaging and educating the global public.

VISTA

Ohio State/Voyager - VISTA Space Park

Example Partner Companies

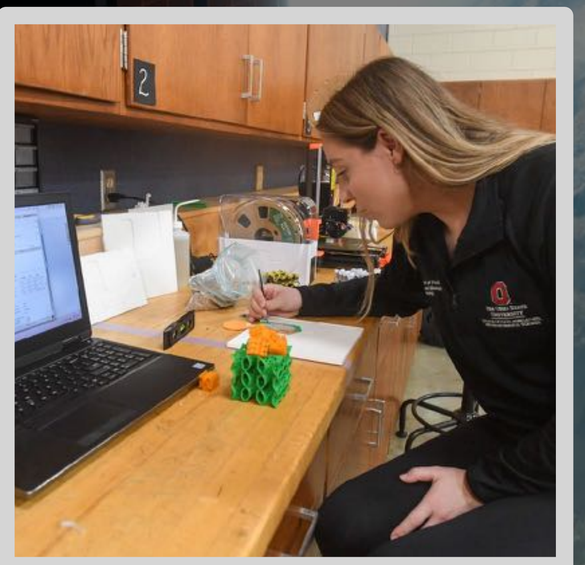
- *Blue Abyss*
- *Nexture Bio*
- *Interstellar Lab*
- *Solar Foods*
- *Orbital Space Technologies*
- *HAMICo, LLC.*
- *Spaero Systems**
- *Apiary Systems**
- *Astraeus Paints and Coatings**

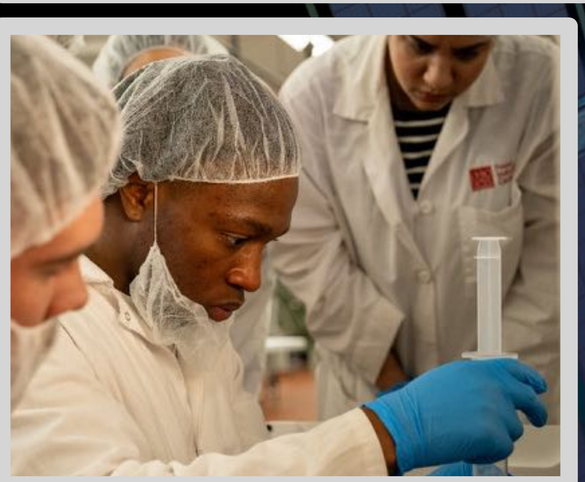
**VISTA/Ohio State/Starlab start-up*

Also in collaboration with:

JobsOhio

ONE COLUMBUS





Welcoming new partners, and open for business :: <u>Today.</u>

One Example (of Many)

Can we laser-weld in space?

Idea

Ohio State Capstone

Ohio Federal Research Network

Driving Innovation Through Strategic Partnerships

$1.2M Funded Proposal for Zero-G flight, with Corporate and Federal partnering

NASA AFRL LINCOLN ELECTRIC Nanoracks

New Partners

VISTA

Experiment and collaboration evolution for flight research in low-Earth orbit

Zero-G flights (August 2024, May 2025) produces **First-ever welds (>100) in zero-G and vacuum.**

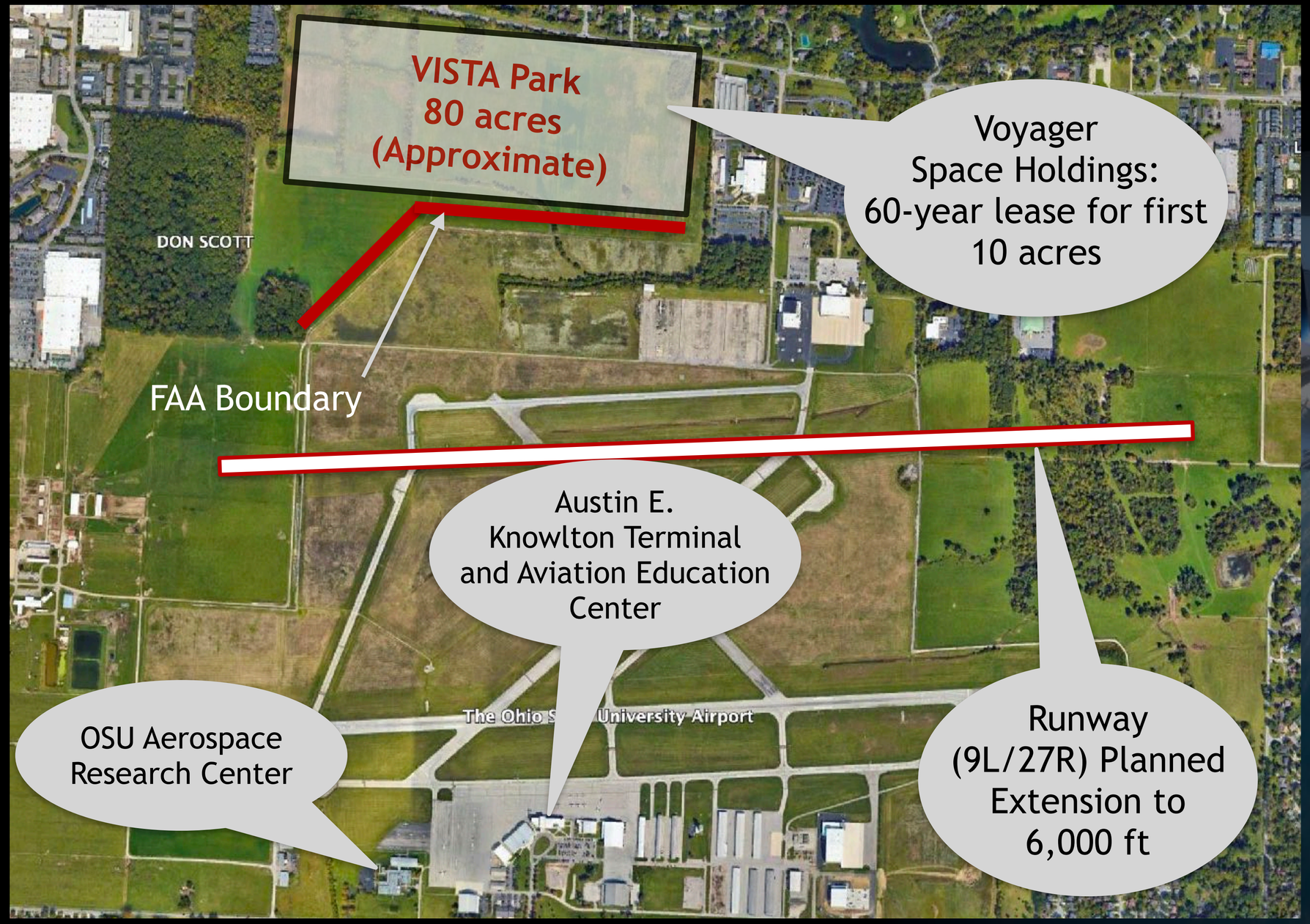
Analyses underway

Idea → Implementation and Iteration → Spaceflight

One Example (of Many)

Eugene Choi (as an example) now working at SpaceX.

Ohio State/Voyager - VISTA Space Park



- On the campus of the US' largest, most comprehensive, public, land-grant research universities, with ~$1.5B in annual research expenditures (2023).
- A 'day's drive' from half the population the US and Canada.
- Located in the center of US' 14th largest city, and 2nd largest city in the Midwest.
- At the heart of a vibrant, multi-sector, commercially-driven economy.
- A short drive to key US National Civil Space (NASA) and US DoD Space (WPAFB) anchors.
- Permanent site development in work at KOSU Airport.
- Construction of private buildings on public (Ohio State) land.
- Elford, Colliers selected as developers by Voyager - July 2025

A Global Ecosystem for Research in Space

VISTA

- Research development through the science park ecosystem.
- Global reach, partnering with universities, companies, space agencies.
- *Starlab* JV partnership mirrors ISS partnership, but in the private sector.

Blue countries - current partners through Space Agencies
Green countries - potential partners through Space Agencies

You are invited!

Encouragement to take the next steps

- Connect and network with university, government, and private-sector colleagues in the state - including Ohio State.
- Learn and understand the nature and scope of Ohio-based Federal R&D requirements in space-related areas (or other areas).
- Build and/or join a collaborative team that is responsive to the needs of these requirement-holders.
- Write and submit a proposal responsive to the RFP.
- If not successful at first, try again!

THE OHIO STATE UNIVERSITY

Go Bucks!

Ohio Federal Research Network

Driving Innovation Through Strategic Partnerships

Parallax ADVANCED RESEARCH

Thank You.

Ohio Department of Higher Education